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(54) Cleaning products.

(57) A harsh-surfaced cleaning product produced by partially coalescing thermoplastic polymer fibrils of a tack-spun pile-surfaced material by applying heat thereto without causing complete collapse of the pile.

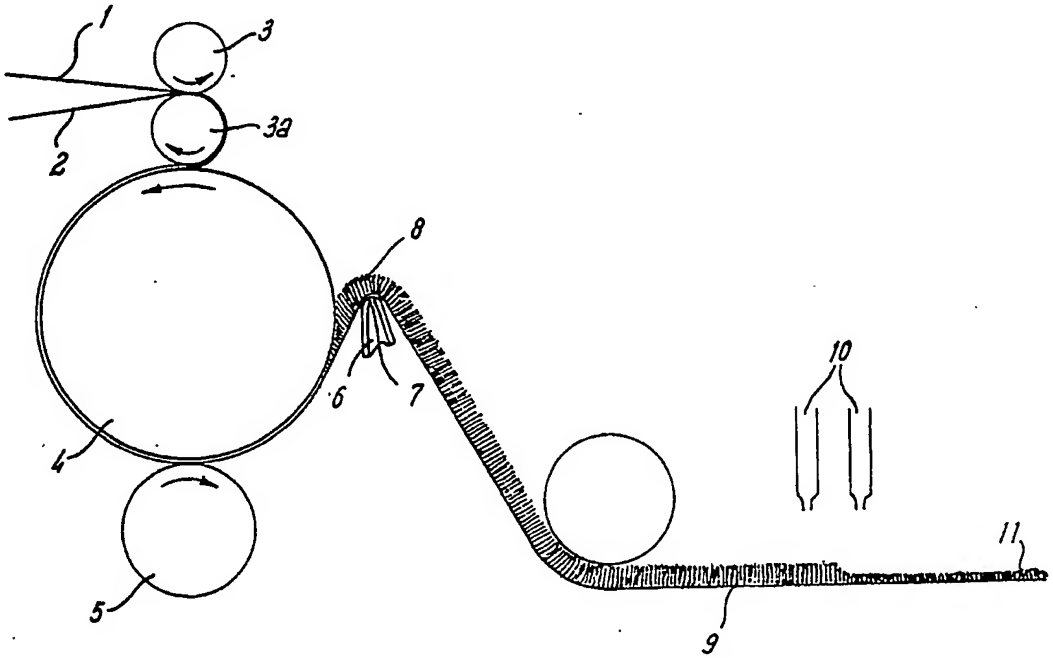

FIG. 1

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CLEANING PRODUCTS

The present invention relates to cleaning products and their production.

It has already been proposed to produce a pile on the surface of a synthetic polymeric material by pressing the material against a heated surface, preferably a heated roll, and separating the material from the surface while cooling the material to below its softening point. In this way fibrils are drawn out from the surface of the sheet and the cooling action ensures that the major part of each fibril remains integral with the polymeric material. This technique is hereinafter referred to as tack-spinning and the products thereof as tack-spun pile surfaced materials.

In the preferred mode of operation of this technique the polymeric material is a thermoplastic and cold air or another cooling medium is blown into the nip formed between the heated roll and the thermoplastic material as the thermoplastic separates from the roll. In this type of process it has also been proposed in UK patent specifications 1329426, 1378638, 1378639, 1378640, 1451311, 1451312, 1451313, and 1481224 to feed the thermoplastic to the roll together with a backing web with the thermoplastic between the heated roll and the backing so that the thermoplastic softens and one side bonds to the backing web under the influence of the heated roll whilst the fibrils are drawn out from the other side of the thermoplastic. Especially in the case of porous or perforated backings it is preferred to direct the cooling medium through the backing web. In a further process it has been proposed in UK patent specification 1334672 to produce a pile on a backing by drawing fibrils through a perforated screen such as, for example, a loosely woven cotton followed by stiffening of the screen. These techniques produce laminar materials consisting of the pilous synthetic polymeric material bonded to the backing. However, UK patent specification 1491901 describes a method in which the backing is separated from the pilous synthetic polymeric material. The above specifications are included herein by reference.

In UK patent specification 1399821 a method of embossing tack-spun pile surfaced products is described in which the thermoplastic pile is collapsed in selected areas by application of heat preferably above the melting point of the thermoplastic material to the areas of the pile where collapse is required. The embossing may be achieved for example by use of a heated embossing roll or by heating selected areas using for example a stencil; the pile may be collapsed by heating the pile side or from the reverse side. Embossing may also be achieved by the method described in UK patent specification 1451322 in which the tack-spun pile-surfaced product is deformed between two co-operating, intermeshing surfaces. In this process the pile remains essentially unchanged and the backing sheet is permanently deformed.

In UK patent specification 1472405 tack spun pile surfaced product having a backing web is heated from the back after completion of the tack spinning process at a temperature insufficient to cause collapse of the pile so that abrasion resistance of the pile and adhesion of the pile to the backing is improved. The pile is said to retain its original feel, texture and appearance.

I have now found that useful products, especially adaptable for cleaning applications, can be made by suitable heat treatment of the pile surfaced products made by a tack-spinning process as described in the above specifications.

According to the present invention, a cleaning product comprises fibrils of a synthetic thermoplastic polymer characterized in that the layer has an outer surface at least a part of which comprises coalesced fibrils.

In one example the tips of substantially all the fibrils are coalesced with one or more other of the fibrils.

The layer is preferably bonded to a substrate, which is conveniently the backing material on which the fibrils are formed in the tack-spinning process.

The coalescence of the fibrils is preferably by their being "welded" together, that is joined by the same thermoplastic polymer as that of the fibrils themselves. The coalescence of the fibrils tends to form bunches or tufts of coalesced fibrils resulting in an irregular "honeycomb" structure, the major part of the coalescence being at the tips of the fibrils. This tends to lead to agglomerations of polymer which give the upper surface a harsh feel.

The pilous form of the fibrils is generally retained in the structure of the layer, the major part of the original fibrils being attached by one end to the substrate. It is preferred that the major part of the tufts of coalesced fibres are substantially erect, that is generally upstanding rather than flattened or felted.

The layer of at least partially coalesced fibrils may be any thickness convenient for the cleaning application envisaged, typically from about 1mm. to about 10mm., usually about 5mm.

The thermoplastic polymer may include addition polymers, for example polymers and copolymers of ethylene, propylene, butadiene, vinyl chloride, vinyl acetate, vinylidene chloride, acrylonitrile and styrene and condensation polymers,

for example polyamides and polyesters e.g. of glycols and aromatic dicarboxylie acids. Blends of polymeric compositions may be used.

Specific examples of thermoplastic polymers that can be employed include polyethylene, nylon, polyethylene terephthalate and polyvinyl chloride. For reasons of cost, the particularly preferred polymeric material is low-density polyethylene, or a blend of low-density polyethylene and a minor proportion of high-density polyethylene.

The substrate to which the layer of coalesced fibrils may be bonded can be of any material suitable for the cleaning application envisaged, provided it can withstand the process by which the cleaning product of the invention is prepared. Porous or non-porous materials may be used, although we prefer to use a porous or perforated material. Examples of particularly suitable materials include woven and non-woven textile webs such as hessian, cotton net, glass-fibre scrims and linen scrims: leather e.g. chamois leather may also be used. The substrate may also be of paper or other material e.g. metal or cardboard having holes formed therein. Expanded or knitted metal, metal mesh, expanded plastics or plastics net may also be used. Plastics foam sheeting e.g. of polyurethane or polyester particularly the open cell variety, is also advantageously useful in the invention.

The layer of coalesced fibrils of a synthetic thermoplastic polymer may be combined, for example by lamination or other joining method, with further such layers to build up a thickness desired for a particular product according to the invention. Alternatively or additionally, the layer may be bonded to other materials which might be advantageously employed as part of the cleaning product, for example sponge pads and cork blocks. This is especially convenient when the layer is bonded to a substrate which is itself bonded to such further material.

The layer of coalesced fibrils and/or the substrate and/ or further materials joined thereto may contain ingredients useful in the cleaning use to which the product is put, for example, soaps and detergents, abrasives and disinfectants.

The invention also includes a method of producing a cleaning product comprising the step of heating a tack-spun pile surfaced material at such a temperature and for such a time that at least some of the fibrils of the pile are softened sufficiently for at least partial coalescence of the fibrils to take place without causing complete collapse of the pile.

The heating may be carried out on tack-spun material at any time after its manufacture, but it is preferred to do so on freshly-made material. It is convenient, therefore, to carry out the process in a continuous manner as a further step in the tack-spinning process after the fibrils have been hardened by cooling. Heating of the pile may be effected in a variety of ways, preferably by heating in such a way that the heat source does not make contact with the pile. Preferably the pile-surfaced side of the material is heated, for example by passing it into a heating zone in which a hot air stream or infra-red radiant heat is allowed to impinge on the pile, or the material may be brought close to, but not sufficiently close to make contact with, a heated surface.

Heating may be concentrated on certain defined regions of the pile surface, for example by localised or intermittent heating. The intensity and duration of the heating step depend upon the degree of coalescence of the fibrils desired for the cleaning product having regard in particular to the degree of harshness required at its surface.

The length of the fibrils in the pile of the tack-spun material to be heated is not critical, but it is preferred to use a material having long fibrils, for example between about 5mm. and 50mm. Very short fibrils do not normally provide a coalesced layer sufficiently deep to be effective in a cleaning application. A "shaggy" pile is preferred such as that normally available in tack-spun pile surfaced materials known as "grass", "lawn" or "mop" varieties.

When the tack-spun material has a backing, it is preferred for this to be porous or perforated. In this case it is also preferred for the fibrils of the tack-spun material to have been hardened by passing coolant e.g. cold air, through the non-pile side of the backing. The backings which may be employed in the tack-spun materials used in the process are as hereinbefore described.

The filament-forming thermoplastic polymers used in the formation of the tack-spun materials used in the process are as hereinbefore described, particular preference being given to tack-spun materials which have been made from polyethylene, especially low-density polyethylene or blends of low-density polyethylene with a minor proportion of high-density polyethylene.

Colour may conveniently be introduced into the products of the invention by employing a coloured filament-forming thermoplastic polymer in the tack-spinning process to produce the tack-spun material from which the cleaning product is made.

The cleaning products of the invention in their various forms as hereinbefore described, find uses primarily in the household scouring field. Thus they may be used as pan scrubbers, especially for pans and other cooking utensils having a non-stick surface which may be damaged by more abrasive materials.

One embodiment of apparatus for producing products of the invention is illustrated diagrammatically in side elevation in Figure 1. A sheet of

polymeric material in film form 1, and a backing web 2 are fed between two guide rolls 3 and 3a, contact a hot roller 4 and fed into the nip between this and a contra-rotating pressure roll 5. On the exit side of the nip the backing is led over a hollow bar 6 having holes 7 through which cooling air is passed to cool and stabilise the pile 8. The tack-spun pile surfaced material 9 is led under hot air jets 10 which serve to coalesce most of the fibrils in the pile into tufts to form the product 11.

Fig. 2 is a plan view and Fig. 3 is a section of an example of a product according to the invention. In Fig. 2 white areas such as 20, 21 are regions of fibril coalescence, and dark areas such as 22, 23 are hollows where, in some cases, the backing 2 is visible. Coalescence occurs principally at the tips of the fibrils and provides a relatively rough surface feel compared to the soft feel of the uncoalesced pile. The uncoalesced portions of the fibrils retain a pile characteristic and provide a spring feel to the pile layer as a whole. The product is pliable and has a generally open-topped cellular type structure with cells or voids communicating through the spaces between uncoalesced portions of the fibrils.

Preferably the whole area is heated to form the product but in some cases only parts of the pile are heated to produce coalescence. Thus the heater may be turned on and off to produce the desired product.

In the case where the product has no backing the fibrils still form a coherent self-supporting layer.

The product can be described as having open-topped cavities which are interconnected between the uncoalesced parts of the fibrils.

Example

Starting Material: "Vivelle" lawn tack-spun material.

Method:

A hot air gun was traversed over the pile surface of the "Vivelle" lawn material, the nozzle of the air gun being about 5cm from the surface of the pile. The temperature of the air at or near the surface was about 90-95° C. The speed of traverse was such that the area on which the air impinged at any time was heated for about 2 to 3 seconds.

Heating can conveniently be done at or just above the Vicat softening temperature of the thermoplastic polymer.

Claims

1. A cleaning product comprising a pilous layer comprising fibrils of a synthetic thermoplastic polymer characterized in that the layer (11) has an outer surface at least a part of which comprises coalesced fibrils.

2. A cleaning product as claimed in Claim 1, characterized in that the tips of substantially all the fibrils are coalesced with one or more other of the fibrils.

3. A cleaning product as claimed in Claim 1 or Claim 2, characterized in that the uncoalesced fibrils or parts of fibrils comprise a tack-spun pile surface.

4. A cleaning product as claimed in Claim 1 or Claim 2 or Claim 3, characterized in that the said layer is bonded to a substrate.

5. A cleaning product as claimed in Claim 4 characterized in that the substrate is the backing material for the tack-spun pile surface.

6. A cleaning product as claimed in any one of Claims 1 to 5, characterized in that the said layer has a thickness of 1mm to 10mm.

7. A method of producing a cleaning product as claimed in any one of Claims 1 to 6 characterized by the step of heating a tack-spun pile surfaced material at such a temperature and for such a time that at least some of the fibrils of the pile are softened sufficiently for partial coalescence of at least some of the fibrils to take place without causing complete collapse of the pile.

8. A method as claimed in Claim 7 characterized in that a heat source for heating the tack-spun material is spaced from the pile.

9. A method as claimed in Claim 7 or Claim 8, characterized in that the tack-spun material has fibrils of 5mm to 50 mm in length.

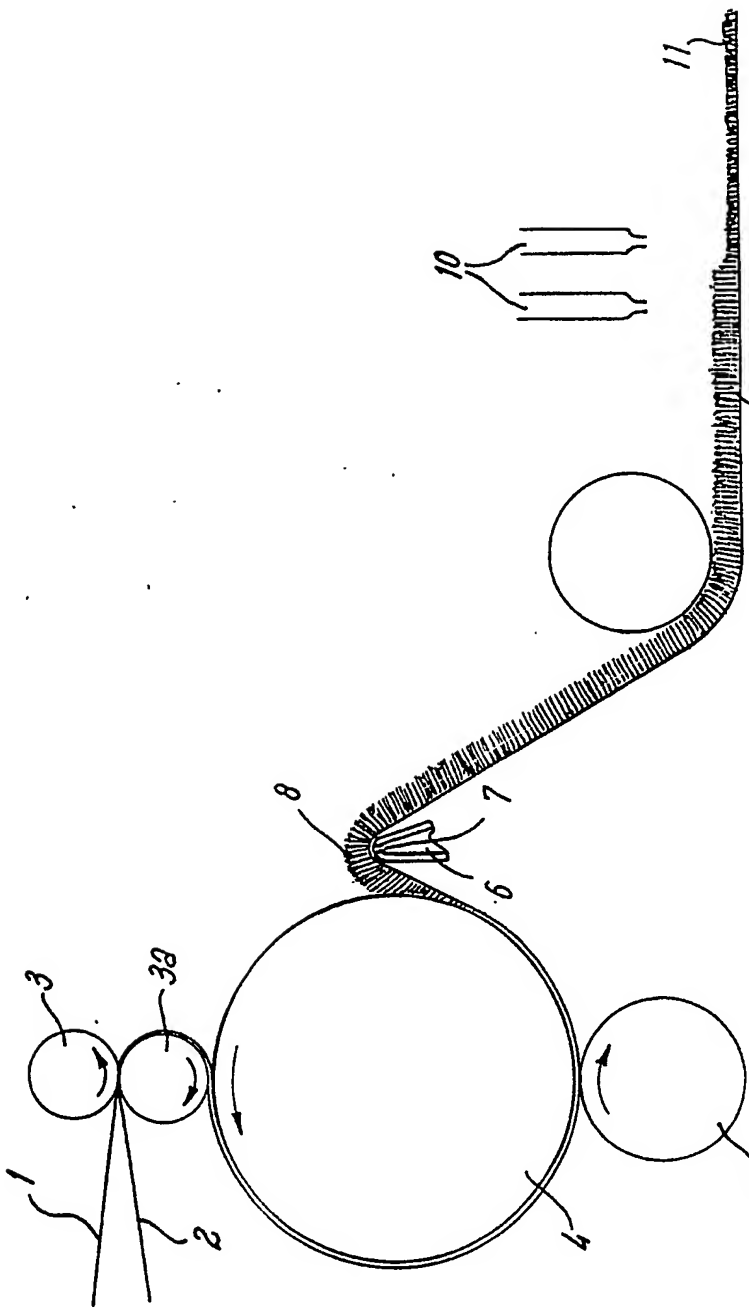

FIG. 1

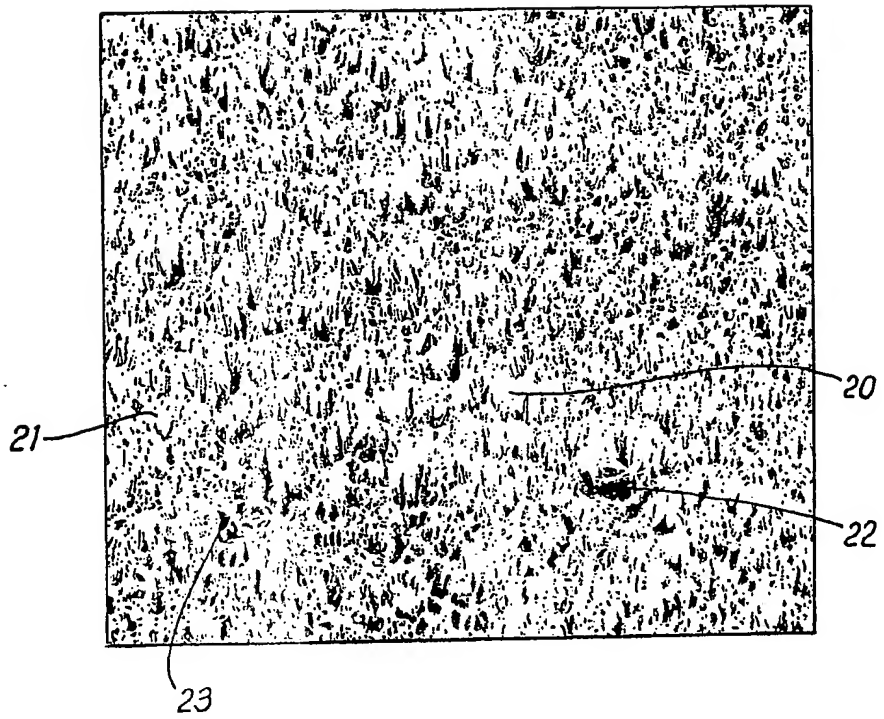

FIG_2

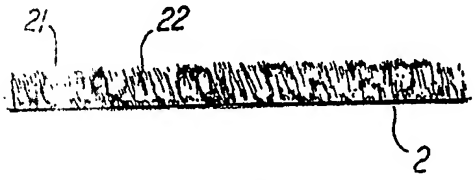

FIG_3